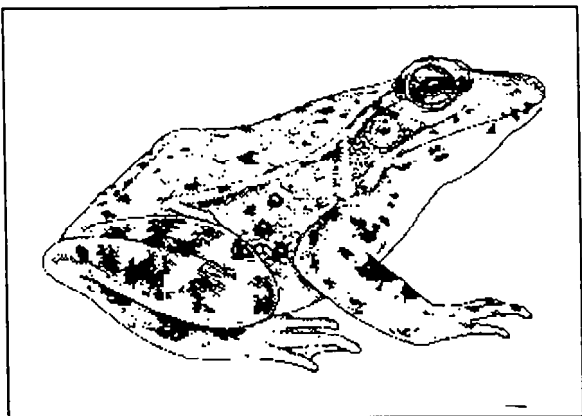


# ◆ CALIFORNIA RED-LEGGED FROG



## INTRODUCTION

The California red-legged frog is California's largest native frog. Its habitat is characterized by dense, shrubby riparian vegetation associated with deep, still, or slow-moving water that supports emergent vegetation. The distribution and population of this species has declined substantially, primarily as a result of habitat loss or degradation and excessive predation. The loss of habitat and declining condition of the species' population have warranted its listing as threatened under the federal Endangered Species Act and a Species of Special Concern by DFG. Major factors that limit this resource's contribution to the health of the Delta are related to adverse effects of the loss or degradation of critical wetland and riparian habitats and the introduction of non-native predators.

## RESOURCE DESCRIPTION

The California red-legged frog historically occurred throughout the Central Valley and now exists only in small isolated populations scattered throughout its historical range. Its current range is chiefly west of the Cascade-Sierra crest from Redding in Shasta County, California, to northwest Baja California. Small populations still exist in the Central Valley and Sierra Nevada, but numbers appear to be declining in both places. Reasons for the decline of this species include the degradation and loss of critical wetland breeding and adjacent terrestrial habitats.

Human-caused stressors add to the species decline. In occupied species-areas, some agricultural practices,

such as discing, mowing, burning, and pest control, result in direct mortality or degradation of habitat. The introduction of non-native fish, bullfrogs, and crayfish, all of which prey on larval, juvenile, or adult red-legged frogs increases the threat to the survival of this species. Some introduced predatory fish are large enough to injure some adults and eat juvenile red-legged frogs. The only reasonably protected population in the Central Valley is the Corral Hollow Ecological Reserve. However, this reserve is currently threatened by siltation from off-road vehicle use and livestock grazing.



## VISION

The vision for the California red-legged frog is to maintain populations of this federally listed threatened species.

Achieving this vision will contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.

Protecting existing and restoring additional suitable aquatic, wetland, and riparian habitats and reducing mortality from non-native predators will be critical to achieving recovery of the California red-legged frog. Restoration of aquatic, wetland, and riparian habitats in the Sacramento-San Joaquin Delta Ecological Management Zone will help in the recovery of this species by increasing habitat quality and area. Establishing emergent vegetation (*Salix* sp., *Typha* sp., and *Scirpus* spp.) in canals, side channels, and backflow pools would provide breeding habitat, forage and escape cover for the California red-legged frog. Establishing these habitats in each ecological unit of the Sacramento-San Joaquin Delta Ecological Management Zone would create migration corridors by linking habitat areas.

Restoration of ecosystem processes and habitats in other ecological management zones will also allow natural floodplains, stream meanderings, and seasonal pools to develop that will assist in the recovery of population elsewhere in the red-legged frog's range. Restoring optimal red-legged frog habitat will also reduce its susceptibility to predation and will reduce

suitable habitat conditions for non-native predators.

California red-legged frog cannot be adequately restored to the Central Valley or the foothill areas without re-introduction. Recovery strategies should focus on property acquisition to preserve areas where the frog is present and to conduct detailed surveys in the western valley and Sierran foothills for remnant populations. Bullfrog predation is a major concern and focused predator management should be developed and implemented on a case-by-case basis in areas identified as important to frog populations. Reintroductions on State and Federal refuge lands with a predator management scheme should be considered.

## INTEGRATION WITH OTHER RESTORATION PROGRAMS

Wetland restoration and management programs that would improve habitat for the California red-legged frog include:

- the Agricultural Stabilization and Conservation Service's Wetland Reserve Program,
- the Wildlife Conservation Board's Inland Wetlands Conservation Program,
- restoration programs administered by Ducks Unlimited and the California Waterfowl Association, and
- ongoing management of State and federal wildlife refuges and private duck clubs.

Restoration efforts will be conducted in cooperation with agencies or organizations with responsibility or authority for restoring wetland aquatic habitats including:

- California Department of Fish and Game,
- California Department of Water Resources,
- U.S. Fish and Wildlife Service,
- U.S. Army Corps of Engineers, and
- Delta Protection Commission.

## LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

Restoration of the red-legged frog populations is

integrally linked with restoration of riparian and wetland habitat in the Central Valley.

## OBJECTIVE, TARGETS, ACTIONS, AND MEASURES



The Strategic Objective is to maintain abundance and distribution.

**SPECIES TARGET:** An increase in or no discernable adverse effect on the size or distribution of species populations.

**LONG-TERM OBJECTIVE:** Develop refuges in habitats throughout its former range that will each maintain 100+ breeding pairs of red-legged frogs, established from reintroductions.

**SHORT-TERM OBJECTIVE:** Locate and protect any remaining populations of red-legged frogs in the Bay-Delta watershed.

**RATIONALE:** Red-legged frogs are virtually extinct in the region, with just a handful of tenuous populations remaining in the Central Valley and bay region (none near the estuary). Their inability to recover from a presumed major population crash in the 19th century (due to overexploitation) has been the result of a combination of factors (in approximate order of importance): (1) predation and competition from introduced bullfrogs and fishes; (2) habitat loss, (3) pesticides and other toxins, (4) disease, and (5) other factors. Because of the poor condition of the few remaining frog populations and the continued existence of major causes of their decline, this objective may not be achievable in either the short or long term. Any refuge developed for this species will require continuous intensive management and development of experimental barriers to exclude non-native species. The long-term goal will be achievable only if the refuge experiments work and are cost-effective (e.g., it might be better to put dollars into restoring areas outside the region where red-legged frogs still maintain populations naturally). Refuges for red-legged frogs will benefit other at-risk species as well, such as giant garter snakes, Pacific pond turtles, and tiger salamanders.

**STAGE 1 EXPECTATIONS:** All red-legged frogs populations in the region will have been located and

protective measures taken where feasible. At least one experimental population will have been established.

## **RESTORATION ACTIONS**

The general target is to increase the population size and distribution of the red-legged frog.

General programmatic actions to assist in reaching the target include:

- acquire land to preserve areas where frogs are present,
- develop predator (bullfrog) control programs,
- increase wetland and riparian habitats in the Central Valley;
- reduce the use of herbicides that adversely affect red-legged frog and their habitats; and
- use fumigants to control rodents from only October to March in known occupied habitats.

## **MSCS CONSERVATION MEASURES**

The following conservation measures were included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions that would help achieve species habitat or population targets.

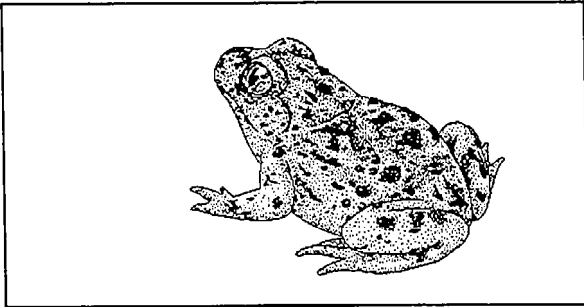
- To the extent consistent with CALFED objectives, enhance or restore suitable habitats near occupied habitat.
- Avoid or minimize CALFED actions that could increase or attract non-native predator populations to occupied habitat.

## **REFERENCES**

Multi-Species Conservation Strategy. 2000. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.

Strategic Plan for Ecosystem Restoration. 2000. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.

# ◆ WESTERN SPADEFOOT TOAD



## INTRODUCTION

The western spadefoot occurs throughout much of the Central Valley, San Francisco Bay, and coast ranges and foothills below 3,000 feet, as well as along the coast in the southern portion of the State. Declining populations have warranted their designation as species of special concern and species of concern by the California Department of Fish and Game (DFG) and U.S. Fish and Wildlife Service, respectively. Major factors that limit these resources' contribution to the health of the Delta are related to adverse effects of conversion of seasonal wetlands and adjacent uplands to other land uses and excessive mortality resulting from introduction of non-native predators and some land use practices.

## RESOURCE DESCRIPTION

Western spadefoot toad populations have declined primarily as a result of habitat loss or degradation and competition or predation from non-native species. The abundance from population to population is unknown but is influenced by the size and quality of individual habitat patches within the fragmented pockets that the species are known to inhabit.

The western spadefoot toad is primarily a lowlands species, frequenting washes, river floodplains, alluvial fans, playas, and alkali flats, but also ranges into the foothills and mountain valleys. Vernal pools covering more than 250 square feet, with fairly turbid water, provide optimal habitats. Most surface movements of the western spadefoot, including breeding activity, are associated with the onset of fall and spring rains that fill traditional breeding ponds. Warm days followed by rains or high humidity levels at night

trigger reproductive and foraging activities and adults of these species sometimes appear in large numbers.

The greatest threat to the continued existence of the toad is habitat loss and competition by non-native species. Habitat loss is a result of increased urbanization and conversion of native grasslands to agriculture. The spadefoot may be found in high densities in isolated areas but adjacent breeding habitat is increasingly being converted for other uses.

Introduction of predatory fish and bullfrogs in known breeding ponds is also an important factor attributed to the decline of these species. Juvenile and adult bullfrogs can prey on larvae and terrestrial forms of these native species. Other important stressors that affect the spadefoot are rodent control activities, which reduce the availability of summer estivation (burrowing) sites. The use of rodent burrows may be more important for the California tiger salamander than for western spadefoot because spadefoots can build their own burrows and also use other appropriate niches. Research on the extent and necessity of burrow use by both species would be valuable. In addition to rodent control activities, development of roads between breeding ponds and terrestrial habitats, resulting in deaths from automobiles during the species' migrations, has also contributed to the decline.



## VISION

The vision for the western spadefoot toad is to maintain this California species of special concern in the Bay-Delta.

Achieving this vision will contribute to overall species richness and diversity and reduce conflict between the need for their protection and other beneficial uses of land and water in the Bay-Delta.

Protecting and restoring existing and additional suitable aquatic, wetland, and floodplain habitats and reducing the effect of other factors that can suppress breeding success will be critical to the recovery of the western spadefoot. Restoration of vernal pool habitats in the Sacramento-San Joaquin Delta Ecological

Management Zone will help recover this species by increasing habitat quality and area. Restoration of ecosystem processes and habitats in other ecological management zones will also allow natural floodplains, meander corridors, seasonal pools, and vernal pools to develop that will assist in the recovery of spadefoot populations.

Implementing guidelines developed by DFG for vegetation, grazing, traffic, and pest management would increase these species' reproductive success and reduce the level of mortality from unnatural sources. These guidelines could be implemented through cooperative agreements with land management agencies and organizations and development and implementation of incentive programs to encourage land use practices that improve habitat conditions for and reduce mortality on these species.

## INTEGRATION WITH OTHER RESTORATION PROGRAMS

Wetland restoration and management programs which contribute to restoration or maintenance of vernal pools that would improve habitat for the western spadefoot include:

- the Agricultural Stabilization and Conservation Service's Wetland Reserve Program, and
- the Wildlife Conservation Board's Inland Wetlands Conservation Program.

## LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

Restoration of the spadefoot toad population is integrally linked with restoration of riparian and wetland habitat in the Central Valley.

## OBJECTIVE, TARGETS, ACTIONS, AND MEASURES



The Strategic Objective is to maintain abundance and distribution.

**SPECIES TARGET:** An increase in or no discernable adverse effect on the size or distribution of species populations.

**LONG-TERM OBJECTIVE:** Establish refuges for California spadefoot toad throughout its range.

**SHORT-TERM OBJECTIVE:** Identify and protect remaining spadefoot toad populations in the Bay-Delta watershed.

**RATIONALE:** Spadefoot toad populations are disappearing rapidly in the Bay-Delta watershed because of habitat alteration, especially urban development, and introductions of non-native fishes into their breeding ponds. They require fish-free breeding ponds next to upland habitat in which they can burrow for over summering. These habitats are naturally somewhat isolated from one another, promoting genetic diversity within the species which presumably reflects adaptations to local habitat conditions. Long-term survival of these diverse populations depends on protected areas containing both breeding ponds and upland habitats.

**STAGE 1 EXPECTATIONS:** A thorough survey of spadefoot toad populations in the Bay-Delta watershed will have been completed and actions taken to protect remaining populations in counties bordering the Bay-Delta system.

## RESTORATION ACTIONS

The general target for western spadefoot is to increase the population size of each species.

General programmatic actions that will assist in reaching the targets include:

- protecting existing habitats from urbanization and conversion to irrigated pasture,
- improve degraded habitats,
- increase vernal pool habitats in the Central Valley;
- reduce the use of herbicides that adversely affect western spadefoot and California tiger salamander and their habitats;
- reduce mowing, to the extent feasible, to control vegetation and livestock grazing near occupied seasonal wetlands from October to March;
- reduce traffic, where feasible, on roads crossed by these species during migration periods;

- develop alternative control measures to replace the use fumigants to control rodents; and
- drain waterways used by the spadefoot and salamander during the periods when these species are dormant could be beneficial by reducing populations of non-native predatory fish and bullfrogs.

## **MSCS CONSERVATION MEASURES**

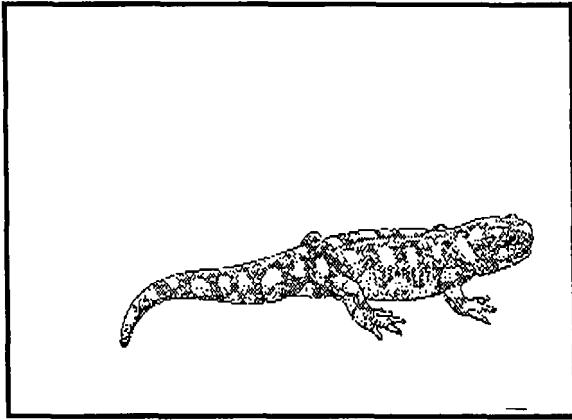
The following conservation measures were included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions that would help achieve species habitat or population targets.

- To the extent consistent with CALFED objectives, enhance or restore suitable habitats near occupied habitat.
- Avoid or minimize CALFED actions that could increase or attract non-native predator populations to occupied habitat.

## **REFERENCES**

- Multi-Species Conservation Strategy. 2000. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.
- Strategic Plan for Ecosystem Restoration. 2000. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.

# ◆ CALIFORNIA TIGER SALAMANDER



## INTRODUCTION

The California tiger salamander occur throughout much of the Central Valley, San Francisco Bay, and coast ranges and foothills below 3,000 feet, as well as along the coast in the southern portion of the State. Declining populations have warranted their designation as species of special concern and species of concern by the California Department of Fish and Game (DFG) and U.S. Fish and Wildlife Service, respectively. Major factors that limit these resources' contribution to the health of the Delta are related to adverse effects of conversion of seasonal wetlands and adjacent uplands to other land uses and excessive mortality resulting from introduction of non-native predators and some land use practices.

## RESOURCE DESCRIPTION

California tiger salamander populations have declined primarily as a result of habitat loss or degradation and competition or predation from non-native species. The abundance from population to population is unknown but is influenced by the size and quality of individual habitat patches within the fragmented pockets that the species are known to inhabit.

Tiger salamanders typically inhabit scattered ponds, intermittent streams, or vernal pools that are associated with grassland-oak woodland habitat below Elevation 1500. Vernal pools covering more than 250 square feet, with fairly turbid water, provide optimal habitats. Most surface movements of

the western spadefoot and California tiger salamander, including breeding activity, are associated with the onset of fall and spring rains that fill traditional breeding ponds. Warm days followed by rains or high humidity levels at night trigger reproductive and foraging activities and adults of these species sometimes appear in large numbers.

The greatest threat to the continued existence of the tiger salamander is habitat loss and competition by non-native species. Habitat loss is a result of increased urbanization and conversion of native grasslands to agriculture. The spadefoot and salamander may be found in high densities in isolated areas but adjacent breeding habitat is increasingly being converted for other uses.

Introduction of predatory fish and bullfrogs in known breeding ponds is also an important factor attributed to the decline of these species. Juvenile and adult bullfrogs can prey on larvae and terrestrial forms of these native species. Other important stressors that affect the spadefoot and salamander are rodent control activities, which reduce the availability of summer estivation (burrowing) sites. The use of rodent burrows may be more important for the California tiger salamander than for western spadefoot. Research on the extent and necessity of burrow use by both species would be valuable. In addition to rodent control activities, development of roads between breeding ponds and terrestrial habitats, resulting in deaths from automobiles during the species' migrations, has also contributed to the decline.



## VISION

The vision for the California tiger salamander is to maintain existing populations of this Federal candidate species in the Bay-Delta.

Achieving this vision will contribute to overall species richness and diversity and reduce conflict between the need for their protection and other beneficial uses of land and water in the Bay-Delta.

Protecting and restoring existing and additional suitable aquatic, wetland, and floodplain habitats and

reducing the effect of other factors that can suppress breeding success will be critical to the recovery of the California tiger salamander. Restoration of vernal pool habitats in the Sacramento-San Joaquin Delta Ecological Management Zone will help recover this species by increasing habitat quality and area. Restoration of ecosystem processes and habitats in other ecological management zones will also allow natural floodplains, meander corridors, seasonal pools, and vernal pools to develop that will assist in the recovery of populations of these species elsewhere in their range.

Implementing guidelines developed by DFG for vegetation, grazing, traffic, and pest management would increase these species' reproductive success and reduce the level of mortality from unnatural sources. These guidelines could be implemented through cooperative agreements with land management agencies and organizations and development and implementation of incentive programs to encourage land use practices that improve habitat conditions for and reduce mortality on these species.

## INTEGRATION WITH OTHER RESTORATION PROGRAMS

Wetland restoration and management programs which contribute to restoration or maintenance of vernal pools that would improve habitat for the California tiger salamander include:

- the Agricultural Stabilization and Conservation Service's Wetland Reserve Program, and
- the Wildlife Conservation Board's Inland Wetlands Conservation Program.

## LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

Restoration of the salamander populations is integrally linked with restoration of riparian and wetland habitat in the Central Valley.

## OBJECTIVE, TARGETS, ACTIONS, AND MEASURES



The Strategic Objective is to maintain abundance and distribution.

**SPECIES TARGET:** An increase in or no discernable adverse effect on the size or distribution of species populations.

**LONG-TERM OBJECTIVE:** Establish refuges for California tiger salamander throughout its range that will maintain its present genetic and ecological diversity.

**SHORT-TERM OBJECTIVE:** Identify and protect remaining California tiger salamander populations in the Bay-Delta watershed.

**RATIONALE:** California tiger salamander populations are disappearing rapidly in the Bay-Delta watershed because of habitat alteration, especially urban development, and introductions of non-native fishes into their breeding ponds. They require fish-free breeding ponds next to upland habitat containing rodent burrows in which they can over-summer. Patches of suitable habitats are naturally somewhat isolated from one another, promoting genetic diversity within the species which presumably reflects adaptations to local conditions. Long-term survival of these diverse populations depends on numerous protected areas containing both breeding ponds and upland habitats.

**STAGE 1 EXPECTATIONS:** A thorough survey of tiger salamander populations in the Bay-Delta region will have been completed and actions taken to protect remaining populations in counties bordering the Bay-Delta system.

## RESTORATION ACTIONS

The general target for California tiger salamander is to increase the population size.

General programmatic actions that will assist in reaching the targets include:

- protecting existing habitats from urbanization and conversion to irrigated pasture,
- improve degraded habitats,
- increase vernal pool habitats in the Central Valley;
- reduce the use of herbicides that adversely affect California tiger salamander and its habitats;



- reduce mowing, to the extent feasible, to control vegetation and livestock grazing near occupied seasonal wetlands from October to March;
- reduce traffic, where feasible, on roads crossed by these species during migration periods;
- develop alternative control measures to replace the use fumigants to control rodents; and
- drain waterways used by the spadefoot and salamander during the periods when these species are dormant could be beneficial by reducing populations of non-native predatory fish and bullfrogs.

## **MSCS CONSERVATION MEASURE**

The following conservation measure was included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions that would help achieve species habitat or population targets.

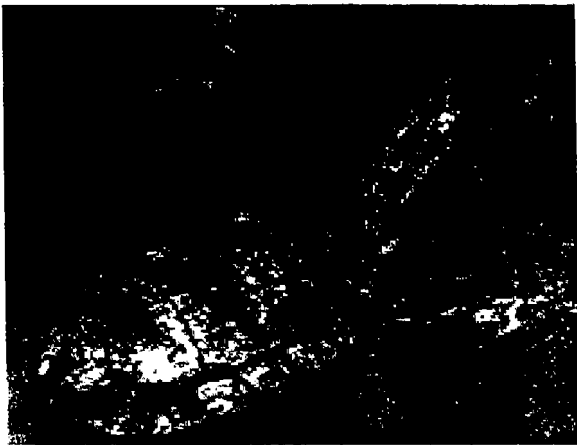
- To the extent consistent with ERP objectives, enhance or restore suitable habitats near occupied habitat areas.

## **REFERENCES**

Multi-Species Conservation Strategy. 2000. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.

Strategic Plan for Ecosystem Restoration. 2000. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.

# ◆ WESTERN POND TURTLE



## INTRODUCTION

The loss of habitat and declining condition has warranted the listing of the western pond turtle as a species of concern by U.S. Fish and Wildlife Service (USFWS) and a Species of Special Concern by California Department of Fish and Game (DFG).

Major factors that limit these resources' contribution to the health of the Delta are related to adverse effects of conversion of aquatic, wetland, riparian, and adjacent upland habitats to other land uses and land use practices that degrade the value of otherwise suitable habitat areas.

## RESOURCE DESCRIPTION

The western pond turtle inhabits ponds, rivers, streams, lakes, marshes, and irrigation ditches with rocky or muddy bottoms. Dense cover and exposed basking sites are important components of these wetland habitat types. The western pond turtle inhabits every region of California except drainages on the eastern slope of the Sierra Nevada. Population densities vary, however, and are highly influenced by the quality of isolated habitats. A disproportionately large percentage western pond turtle populations are adults, indicating poor reproductive success.

Historic habitat areas used by these species have been substantially reduced as a result of converting land for agriculture, urban, or industrial uses or degraded as a result of ongoing land-use practices. Remaining habitat areas, such as ponds, rivers, streams, lakes, marshes, and irrigation ditches, are largely

fragmented. Associated uplands, used for reproduction and hibernation, are largely unavailable. Upland habitats adjacent to aquatic habitats are now mostly isolated in small riparian bands along the tributaries that supply water to the Sacramento and San Joaquin rivers and along canals with small levees.

Because much of the original habitat used by these species has been lost, irrigation canals and ditches (especially canals with nearby vegetation) now provide important replacement habitat for these species. Rice farming makes up a significant portion of the agricultural activity in the Sacramento Valley, and drainage ditches associated with rice farming practices provide much of this surrogate habitat. Adjacent breeding and hibernating cover, however, is often limiting for these species.

Other factors that limit these species populations include:

- some agricultural practices (e.g., disking, mowing, burning, and applying herbicides and rodenticides) that degrade habitat or cause mortality;
- introduced large predatory fish that prey on juveniles and injure adults; and
- mortality caused by flooding of hibernation sites during heavy rains, floods, or for waterfowl.



## VISION

The vision for the western pond turtle is to maintain the abundance and distribution of this California species of special concern in order to contribute to the overall species richness and diversity.

Achieving this vision will reduce the conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.

Protecting existing and restoring additional suitable wetland and upland habitats will be critical to achieving recovery of the giant garter snake and western pond turtle. The Ecosystem Restoration Program Plan's (ERPP's) proposed restoration of aquatic, wetland, riparian, and upland habitats in the